Session 4C: Contaminated Sediments

Questions & Answers

Ed Long
Q: What were the sources of the phenols?

A: I wouldn't speculate on the sources, that was not a part of the study, sorry.

Q: How many replicates did you take for the benthic taxonomy assessments at each of your stations?

A: We had one at each station, one complete sample.

Q: Was there a variability assessment done to determine that one was a good amount?

A: Not as a part of this study, but we have data from previous studies on that, I believe.

A: This was obviously a compromise because of the cost, but we had replicates per strata but one sample per station that we sampled, we took the entire contents, a 10th of a meter square.

Q: Also, I'd like to say that this is just an awesome study, I'm very impressed, a huge area and getting all these type of samples together in one study, it's very impressive.

A: I agree, I'm in awe that we were able to pull this off. And I want to say also that the data are now available on the Ecology website.

Q: I just wanted to make a comment that all the fish sampling that we are doing also within PSAMP, all the sites that you are showing, hot spots for PAHs and PCBs are also correlating quite nicely with all the English sole data and the herring data that we are looking at showing the central Puget Sound basin having a PCB signal relative to the other basins.

Kathy Godtfredsen
[Question not recorded.]

A: Sure, right now, we're putting together a couple of peer review journal articles that should be submitted the next couple of months, and after they are submitted, we're going to be working on a gray literature document which will have all of the data that will be available as well.

Robert Zisette
Q: I'd like to know what the design life of the cap is and if you have done any modeling of potential failure modes, and when those would likely occur if you have done those, the analysis?

A: That was not done by us, we've just been involved since the post-remediation. But yes, the whole design was based on guidelines which I'm not particularly familiar with and a lot modeling for earthquakes and the like was all conducted to ensure its effectiveness. This was more of the verification that it has been working.

Q: What were the levels in the hot spots sediments, concentrations of mercury?

A: There was up to almost 4 milligrams per kilogram was the maximum, but they averaged around 2.

Q: I noticed that mercury levels were elevated in the thin cap area after the cap was put in place from before the cap was placed, could you explain why that might be?

A: I think there are several processes we don't have enough to assess what the mechanism for that is. One obvious hypothesis is that it just has a higher concentration of fine material in a thin cap area; it's exposed to less shoreline action, and it's a flatter slope. But the potential sources would be re-sedimentation of contaminated material onto the cap, potential suspension during the application of the capping materials and integration of the underlying sediments into those and even potential migration, or bioturbation effects, post-cap process that would have introduced mercury up to the surface of the thin cap.

Q: Why isn't there any biomonitoring of bivalves or things like that, whether the remediation was successful?

A: The habitat monitoring component was more of, well all of it, was just a verification. It wasn't designed to be a scientific study to evaluate in detail the success or effects of the remediation but to just verify there was meeting in general goals so there weren't specific benthic density goals established for the remediation.

Q: My question is related to the two questions preceding: the risk of failure and the elevated concentrations in the thin cap. Is the monitoring set up particularly in the thicker cap area, is monitoring set up with only surface sediment sampling, or is set up in such a way where you could watch over time migration of contaminants through the cap?

A: It isn't. We just looked at the 0-to10 centimeter fraction and zero two centimeters, so yes, we can look at the most recently deposited sediments and then it's just we're going to look for sediment quality over time, so this is just one year's worth of data. We will be collecting more data this summer.

Tom Gries
Q: Once upon a time in 1994-95 we did a federal-state-port EIS for a site-specific area for multi-user disposal site offshore of the southwest harbor project, which is very centrally located and still one of the prime sites and one of the most contaminated properties in Elliott Bay that needs to be cleaned up and I sure hope that the committee is not losing sight of the fact that EIS is already done and that can be an ideal candidate for the first multi-user disposal site facility. I would sure love to see that project get built someday, it's already been five or six years.

A: We've not lost sight of that but notwithstanding, it isn't an aquatic disposal site, there are definitely difficulties with that these days and it also does not address the decision made to include treatment. It could still be part of the solution, but I don't think it would address the interest in creating treating capacity.

Q: What are the realities of using the chemical properties so many of our persistent pollutants are high KOW chemicals, for some reason I think about chicken fat, but I don't know what the engineering realities are of treating the volumes of sediment that would have to be treated, but is it at all technically feasible to remove these substances?

A: It depends on who you talk to. I think there has been a real rapid evolution not only in the technologies that we are looking at but also in the thinking as to whether or not it is feasible on a large scale or not, and there's variation on whether this technology is feasible on large-scale versus that. I think I was among the more skeptical even a year ago. I don't think the technical hurdles are the hurdles at this point and time. The hurdles now are this region. The type of material that we would be talking about treating is being driven not by maintenance dredging such as [what's] happening on the east coast, regular supply of maintenance dredging at the Corps can provide. What's being driven by cleanup where environmental dredging type material, which is sporadic in nature and not very predictable and not very reliable, and that's a major hurdle for the private treatment companies to try and deal with. They need to be operating…most of them need to be operating online all the time. So that's a bigger issue, almost in the technology. Another issue is public perception, no matter what we choose, aquatic upland disposal or treatment, there's going to be a lot of public perception issues, permitting issues, but really, the main things are going to be somehow ensuring a reliable supply and keeping it such that the tipping fee is competitive, that the various ports and the various dredgers find appealing to move contaminated material and put it into this type of facility.

Q: What sort of strategies have you entertained for getting reliable sediment sources? Is it just in the Puget Sound Basin or are you talking about Washington State?

A: We could entertain somewhat beyond the Puget Sound Basin but the cost of moving material over land makes it prohibitive pretty quickly. The cost of barging makes it such that you can barge material from north or south Puget Sound to central are and you probably could keep it cost competitive. A number of solutions have been mentioned including mandating material go to this facility, a lot of resistance to try and go the legislature and do that. I think that the most likely scenario is that either the public sector can build a separate or in a partnership with a treatment firm build a contiguous storage facility, whether in water or on land, stockpile a couple of years' worth of cleanup material and then meter it out into the treatment facility over time.

Kathy Godtfredsen
Q: This question is regarding the PCB study. Did you expect to see any effects with the relatively short timeframe that you looked at, and are there plans to do longer term studies of the effects of those concentrations on fish?

A: So when you say, relatively short timeframe, do you mean in terms of the challenge time or the dosing period. We felt the dosing period was pretty representative of the time that fish would be seeing PCBs as they travel through the waterway. With respect to the challenge period, that's just the traditional method that that, you look at that end point, and I don't think you look at it for over 14 days because then you could see it was sort of leveling off there at the top. Basically, you are trying to look at how the system is functioning and I think we have a pretty good indicator about how the system is doing.

Q: Another question about the fish study. Given the fact that I think there is evidence that lipid levels decline in the out migrant juvenile salmon, I was wondering if you measured lipid levels in the fish and what you protocol was for feeding during the vibrio challenge and post?

A: We did measure lipid levels. They were about 6 to 7 percent in our salmon during the study. The salmon were not fed during the challenge, the two-week period, and if you're comparing them to what you are seeing in the waterway, they are higher than what you see in the waterway. In the waterway you'll see 1 to 3 percent, basically. We looked into that a little bit. There's a good article out, Debrosk et al, 1999, in ET&C and they talk about the effect of lipids in the fish, in the food, that changes during the challenge period and that sort of thing and it appeared not to follow fugacity concepts as we thought perhaps it might, so it's hard to say exactly the effect that has in terms of ecological relevance but we are interested in that question, too.

Q: What stage of smoltification were your fish were in?

A: We did monitor the stages of smoltification. We have data that are up on the poster downstairs. Basically these fish were not fully smolted during the part 1 that I showed here. If you look at the sodium plasma levels, they were about 200 during these phases, then they dropped down to about 170 and after the vaccination into the part 2 phase.

Ed Long
Q: You indicated that a very small area of the Sound is actually contaminated with respect to the kind of test you did, particularly with the bioassay tests. Could you comment on the fact that most of those locations, of course, were estuaries, which are rather important for the biological integrity of the whole Sound itself, and the fact that these sediments, while they may not represent acute toxic site for a lot of biota, they are often contaminated with persistent compounds that will move via the flux of the contaminants from these into the rest of the Sound maybe more intriguing in the long run. We've got killer whales now with high levels of PCBs etc.

A: For this million surveys that we have run elsewhere in U.S. bays and estuaries, the sub-lethal tests have shown much higher incidence of significant results than the acute test with the amphipod. So one of the significant things that is important to understand is that acute toxicity is a rare event. Nationwide it only

happens in about 12 percent of the samples; here it's about 1/10 of 1 percent, but that does not exonerate the sediments as being totally clean because there are all kinds of other biological things that can happen. One of which is bioaccumulation of persistent materials up through the food chains. That's well known, especially in an estuary where you have valuable resources like salmon migrating through.

Q: I was wondering if in your conclusions you aren't doing a little comparing of apples and oranges. When I think of the water bodies that I am familiar with that you have studied, they are themselves embayments. Biscayne Bay for example, where as a much smaller area and a semi-enclosed waterbody, you might think of Puget Sound as being more an inland sea and Elliott Bay being more comparable to Biscayne Bay or Everett Harbor or Bellingham Bay. I just wonder what you think, because you know more about what you have done than I do?

A: Some of the places we have sampled really are not too different. Biscayne Bay is a huge north-to-south open system that was largely non-toxic and not contaminated—it's carbonate sands. It doesn't accumulate toxic chemicals. We didn't get any hits to speak of, except in the tributaries, the Miami River was really bad and the mysterious South Biscayne Bay plume that we can't identify the source of toxicity was very toxic. Boston Harbor is an enclosed system, there's really no open basin to Boston Harbor *per se*, and that's where she came from, so I know. Tampa Bay, a huge open system, very small portion at the head of it, the seaboard channel is toxic. Galveston Bay, they have an open system, we got hits up in Houston Ship Canal, so it's not too different than what we saw here. San Francisco Bay, we spent 10 years working the San Francisco Bay where we get hits, and San Francisco Bay is the same as Puget Sound, it's around the perimeter, Oakland Harbor, all those peripheral systems where we get toxicity.

Q: Why do the percentages of the areas contaminated seem that different, or are they not different? You are saying 1/10th of a percent of the sampled area here was toxic.

A: The worst place we have encountered is Newark Bay, New Jersey, North Bay and the tributaries and lower Hackensack River. About 88 percent of that area we sampled was toxic in the amphipod test and that's a closed system. The next worst was San Diego Bay, again a closed system, extremely toxic to the amphipods. Boston Harbor not too far behind, but Puget Sound, we have this huge system that is open and is well flushed a lot of it's deep, a lot of is some distance from sources where we get the hits is up in the urban harbors and waterways.

Robert Zisette
Q: I have a question on the Eagle Harbor site. I was understanding that the installment of a slurry wall was one of the key remedies, and I was wondering if we had any data for the benefits or effectiveness of that remedy?

A: We did not look at that aspect of the designs specifically.